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Ann M. Lee Agent for Applicants Lawrence Livermore National Laboratory P.O. Box 808, L-703 Livermore, CA 94551			CANTELMO, GREGG	
			ART UNIT	PAPER NUMBER
			1745	
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Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/025,399	PHAM ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Gregg Cantelmo	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) Responsive to communication(s) filed on 14 December 2004.  
 2a) This action is **FINAL**.                            2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) Claim(s) 1-4,6,7 and 11-20 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-4,6,7 and 11-20 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
     Paper No(s)/Mail Date \_\_\_\_\_

4) Interview Summary (PTO-413)  
     Paper No(s)/Mail Date. \_\_\_\_\_

5) Notice of Informal Patent Application (PTO-152)

6) Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 21, 2003 has been entered.

### ***Response to Amendment***

2. In response to the amendment filed December 14, 2004:

- a. Claims 1-4, 6, 7 and 11-20 are pending. Claims 5 and 8-10 have been cancelled as per Applicant's request;
- b. The specification objection has been overcome in light of the amendment filed August 21, 2003;
- c. The prior art rejections of record are withdrawn in light of the amendment and Applicant's arguments.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 4 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not

described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The claim now recites that the anode, cathode and electrolyte are porous. However the original disclosure does not support this claim. For example of the electrolyte being porous. Furthermore if each of the electrodes and electrolyte are porous this would permit reactant gas cross-over between each electrode through the porous electrolyte which is not desired.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 3 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase "said doped-ceria" is unclear as to which of the plural doped-ceria additives is being further defined. Note claims 1 and 12 recite doped-ceria for both the anode and electrolyte. Thus clarity is requested with respect to claims 3 and 20.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-3, 6-7 and 12-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 5,350,641 (Mogensen) in view of either EP 0 275 356 A (EP '356) or Van herle et al. "Low temperature fabrication of (Y,Gd,Sm)-doped ceria electrolyte" (hereafter referred to as Van herle) and U.S. patent No. 5,937,264 (Wallin).

With respect to claims 1-3 and 6-9:

Mogensen discloses a solid oxide fuel cell (SOFC), comprising an anode including doped ceria, and electrolyte and a cathode (abstract and col. 3, line 9 through col. 4, line 4 as applied to claim 1). Note that the operating temperature of claim 1 does not further limit the SOFC fuel cell system. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein. Furthermore, the prior art obviating claim 1 would have a reasonable expectation of success for operation within the temperature range of claim 1, absent clear evidence to the contrary.

The anode is composed of NiO/doped ceria (col. 2, ll. 19-52 as applied to claim 2).

The doping material in the ceria can be gadolinium oxide, lanthanide oxide and yttria oxide (col. 4, ll. 1-3 as applied to claim 3).

The differences between the instant claims and Mogensen are that Mogensen does not teach of the electrolyte containing doped-ceria (claims 1 and 6) or of the cathode containing a cobalt iron based material (claim 1) and more particularly a cathode material of either  $(La, Sr)(Co, Fe)O_3$  or  $(La, Ca)(Co, Fe, Mn)O_3$  (claim 7) of the fuel cell operating at a temperature in the range of 400-700° C (claim 1) of the doped-ceria comprising doped-ceria formed from a process of colloid spray deposition or aerosol spray casting (claim 8), wherein the cobalt iron based material is deposited by colloid spray deposition or aerosol spray casting (claim 9).

With respect to the electrolyte containing doped ceria (claims 1 and 6):

The electrolyte of Mogensen is YSZ (yttria stabilized zirconia).

EP '356 discloses that doped ceria electrolytes ( $CeO_2$  doped with materials such as  $CaO$  or  $Gd_2O_3$ ) compared to zirconia based electrolytes are preferable since the exhibit higher conductivity than the zirconia based electrolytes and can be operated at lower temperatures (page 3, II. 42-45).

Van herle also discloses of a prevailing trend from YSZ electrolytes to doped ceria electrolytes (abstract). The electrolyte formed therein provides an electrolyte having a high density and improved conductivity at lower operating temperatures.

The motivation for using doped-ceria electrolyte is that it would have improved the conductivity of the electrolyte and further reduced the operating temperature of the SOFC.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by using doped-ceria electrolyte since it would have improved the conductivity of the electrolyte and further reduced the operating temperature of the SOFC.

With respect to the cathode containing cobalt iron based material (claims 1 and 7):

Wallin discloses of an electrode/electrolyte combination used in solid oxide fuel cells (abstract, col. 1, ll. 12-20, and col. 3, ll. 13-15 and 56-65) wherein the ion-conducting material in the electrode is a number of perovskite compositions. In particular when the ionically conductive material is ceria or doped ceria, Wallin teaches that the electrocatalyst in the electrode is preferably a cobalt iron based material, and further a  $\text{LaSrFeCoO}_3$  material (col. 6, ll. 7-9).

The motivation for using a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  is that it lowers the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by selecting the cathode to be a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  since it would have lowered the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ

297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

With respect to the operating temperature of claim 1:

As discussed above, both EP '356 and Van herle disclose that the use of doped-ceria electrolytes provide much higher conductivity than zirconia based electrolytes. Thus there is ample motivation for replacing the zirconia electrolyte of Mogensen with a doped-ceria electrolyte to provide an electrolyte having a higher conductivity at lower operational temperatures. The combination of the teachings of Mogensen, EP and Wallin as set forth above teach all of the same components as recited in claim 1. Since the components are the same, there is a reasonable expectation of success that the fuel cell described above would effectively operate at an operational temperature of 550° C and achieve the same power outputs, absent clear evidence to the contrary. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

"[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on *prima facie* obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the

same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). “When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not.” *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Therefore, the *prima facie* case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed product. *In re Best*, 562 F.2d at 1255, 195 USPQ at 433. See also *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See also *In re Ludtke*, 441 F.2d 660, 169 USPQ 563 (CCPA 1971); *Northam Warren Corp. v. D. F. Newfield Co.*, 7 F. Supp. 773, 22 USPQ 313 (E.D.N.Y. 1934). See MPEP § 2112.01.

Furthermore with respect to claim 1, the claim now recites the phrase “capable of operating in the temperature range of 400-700°C. The term “capable of” is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson*, 69 USPQ 138.

With respect to the doped-ceria and cobalt iron based cathode each being formed from colloidal spray deposition or aerosol spray casting (claim 1):

These claims do not further define the structure of the claims and are instead drawn to the process of making the particular components in each claim.

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted).

"The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature" than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.

In the instant case, the prior art rejection obviates the use of doped-ceria as the electrolyte, thus the end product is obvious. Since the claimed invention is drawn to the

fuel cell and not a method of making the fuel cell, the manner in which the doped-ceria is not germane to the claimed invention absent clear evidence to the contrary.

With respect to claims 12-17:

Mogensen discloses a solid oxide fuel cell (SOFC), comprising an anode including doped ceria (abstract and col. 3, line 9 through col. 4, line 4) and a methane fuel (col. 2, ll. 56 as applied to claim 12).

The fuel source of Mogensen can be either hydrogen or methane. The operating temperature of claim 14 does not further limit the SOFC fuel cell system and is not accorded patentable weight since it is an intended operational use of the fuel cell of claim 14 (col. 2, ll. 54-57 as applied to claim 14). A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

The anode is composed of NiO/doped ceria (col. 2, ll. 19-52 as applied to claim 17).

The differences between the instant claims and Mogensen are that Mogensen does not teach of the electrolyte containing doped-ceria (claim 12) or of the cathode containing a cobalt iron based material (claim 12), of the fuel cell operating in a temperature range of 400-700° C (claim 13), operating the cell at about 550° C (claim 14), of operating the fuel being hydrogen and a power output of up to 400

mW/cm<sup>2</sup> is produced at an operating temperature of 550° C (claim 15), of the fuel being methane and wherein a power output of 320 mW/cm<sup>2</sup> is produced at an operating temperature of 550° C (claim 16), of the cathode containing a cobalt iron based material (claim 1) and more particularly a cathode material of either (La,Sr)(Co,Fe)O<sub>3</sub> or (La,Ca(Co,Fe,Mn)O<sub>3</sub> (claim 19).

With respect to an electrolyte containing doped ceria (claim 12):

The electrolyte of Mogensen is YSZ (yttria stabilized zirconia).

EP '356 discloses that doped ceria electrolytes (CeO<sub>2</sub> doped with materials such as CaO or Gd<sub>2</sub>O<sub>3</sub>) compared to zirconia based electrolytes are preferable since they exhibit higher conductivity than the zirconia based electrolytes and can be operated at lower temperatures (page 3, II. 42-45).

Van herle also discloses of a prevailing trend from YSZ electrolytes to doped ceria electrolytes (abstract). The electrolyte formed therein provides an electrolyte having a high density and improved conductivity at lower operating temperatures.

The motivation for using doped-ceria electrolyte is that it would have improved the conductivity of the electrolyte and further reduced the operating temperature of the SOFC.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by using doped-ceria electrolyte since it would have improved the conductivity of the electrolyte and further reduced the operating temperature of the SOFC.

With respect to the cathode containing cobalt iron based material (claim 12):

Wallin discloses of an electrode/electrolyte combination used in solid oxide fuel cells (abstract, col. 1, ll. 12-20, and col. 3, ll. 13-15 and 56-65) wherein the ion-conducting material in the electrode is a number of perovskite compositions. In particular when the ionically conductive material is ceria or doped ceria, Wallin teaches that the electrocatalyst in the electrode is preferably a cobalt iron based material, and further a  $\text{LaSrFeCoO}_3$  material (col. 6, ll. 7-9).

The motivation for using a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  is that it lowers the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by selecting the cathode to be a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  since it would have lowered the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

With respect to the operating temperature of claims 13-16:

As discussed above, EP '356 discloses that the use of doped-ceria electrolytes provide much higher conductivity than zirconia based electrolytes. Thus there is ample motivation for replacing the zirconia electrolyte of Mogensen with a doped-ceria electrolyte to provide an electrolyte having a higher conductivity at lower operational temperatures. The combination of the teachings of Mogensen, EP and Wallin as set forth above teach all of the same components as recited in claims 13-16. Since the components are the same, there is a reasonable expectation of success that the fuel cell described above would effectively operate at an operational temperature of 550° C and achieve the same power outputs, absent clear evidence to the contrary. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

"[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on *prima facie* obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34

(CCPA 1977)). Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). “When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not.” *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Therefore, the *prima facie* case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed product. *In re Best*, 562 F.2d at 1255, 195 USPQ at 433. See also *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See also *In re Ludtke*, 441 F.2d 660, 169 USPQ 563 (CCPA 1971); *Northam Warren Corp. v. D. F. Newfield Co.*, 7 F. Supp. 773, 22 USPQ 313 (E.D.N.Y. 1934). See MPEP § 2112.01.

With respect to the power output of the cell at an operational temperature of 550° C (claim 15):

As discussed above, Mogensen teaches that the fuel can be hydrogen. Mogensen in view of EP '356 and Wallin obviates the fuel cell of claim 15. Upon using hydrogen fuel in the cell of Mogensen in view of EP '356 and Wallin, since the composition of the fuel cell and the fuel used are the same as the instant claim, the prior art of record will generate the same power output when operated at a temperature of about 550° C.

A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

With respect to the power outputs of the cell at an operational temperature of 550° C (claim 16):

As discussed above, Mogensen teaches that the fuel can be hydrogen. Mogensen in view of EP '356 and Wallin obviates the fuel cell of claim 16. Upon using hydrogen fuel in the cell of Mogensen in view of EP '356 and Wallin, since the composition of the fuel cell and the fuel used are the same as the instant claim, the prior art will inherently generate the same power output when operated at a temperature of about 550° C.

A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

#### ***Response to Arguments***

7. Applicant's arguments filed August 21, 2003 have been fully considered but they are not persuasive.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant argues that Mogensen does not teach or suggest a desire to reduce the operating temperature of the fuel cell.

The Examiner is not persuaded by this argument. Applicant's position fails to appreciate that which would have been known to one of ordinary skill in the art at the time the claimed invention was made.

It is apparent from various cited references including Van herle and EP '356 that the desire to reduce operating temperatures of SOFCs is well known in the art. These references suggest the desired combination since it would have improved the fuel cell operation of Mogensen at lower operating temperatures.

Given that the motivation to replace the YSZ electrolyte of Mogensen with a doped ceria electrolyte as taught by either EP '356 or Van herle it is further held that the modifications of the cathode material as taught by Wallin would have been obvious as well. Wallin teaches that the use of such cathode materials are desired when using doped ceria electrolytes. Thus in modifying the teachings of Mogensen to have a doped

ceria electrolyte as taught by either EP '356 or Van herle, one would have further found it obvious to select the cathode materials of Wallin for the reasons set forth above.

Applicant argues that the process deposition claim limitations of colloidal spray deposition does impart structural characteristics that enable it to operate at lower temperatures.

But it is apparent from the prior art of record that SOFCs operating in this range are known in the art and not exclusive to colloidal spray-deposited anodes. Thus the prior art, while formed by other processes, operates in the same temperature range and thus would appear to be structural equivalents.

Applicant's arguments to claim 1 with respect to the temperature range are not persuasive. The claim now recites the phrase "capable of operating in the temperature range of 400-700°C. The term "capable of" is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson*, 69 USPQ 138. Again the prior art of record shows that it is known to operate SOFCs in the claimed temperature range and further since the prior art combination renders the claimed invention obvious, there is a reasonable expectation that the prior art rejection would operate in the same range. Especially in light of the teachings of EP '356 and Van herle. Applicant's arguments fail to provide clear and convincing evidence to the contrary.

***Claim Rejections - 35 USC § 103***

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mogensen in view of Wallin and either EP '356 or Van herle as applied to claims 1-3, 6-

7 and 12-17 above, and further in view of either U.S. patent No. 6,458,170 (Visco) or U.S. patent No. 5,306,411 (Mazanec).

Claim

The teachings of Mogensen in view of EP '356, Van herle and Wallin have been discussed above, incorporated herein.

Note: it appears that the use of the starch or carbon is particular to the process of forming pores in the fuel cell and therefore is not readily present in the fuel cell product of the claims since this material forms the pores in the fuel cell. Thus the pore former is not clearly an integral component of the fuel cell and is an intermediary component for forming pores which is a temporary component of the cell and in order to fabricate the pores of the cell cannot be present, else the pores would not exist in the fuel cell system and ion transport of the cell would be inhibited. However, for the record, such an intermediate component as a pore-forming material is known and obvious.

Visco teaches that it is desired to form a SOFC having a pores therein. In order to form pores in a ceria based material it is well known in the art to impart a starch material in a fuel cell component and thereafter dissolve the starch to form the pores (col. 6, ll. 38-40). Mazanec similarly teaches of the desire to form a porous component in a SOFC (col. 47, ll. 17-23).

The motivation for forming pores in a SOFC fuel cell is to enable and enhance ionic conductivity of the fuel cell system.

The motivation for providing starch in the fuel cell is to effectively form the pores in the fuel cell by dissolving the starch from the fuel cell. The result being a porous component of the fuel cell having enhanced ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by providing a starch to the fuel cell since it would have provided a means for forming pores in the fuel cell which would have enhanced the ionic conductivity of the fuel cell.

***Response to Arguments***

9. Applicant's provides no additional arguments to the rejection of claim 4 apart from those arguments discussed in item 7 above, incorporated herein.

***Claim Rejections - 35 USC § 103***

10. Claims 18-20 rejected under 35 U.S.C. 103(a) as being unpatentable over Mogensen in view of Wallin and either EP '356 or Van herle as applied to claims 1-3, 6-7 and 12-17 above, and further in view of U.S. patent No. 5,672,437 (Yajima).

The teachings of Mogensen in view of EP '356, Van herle and Wallin have been discussed above, incorporated herein.

The doping material in the ceria of Mogensen can be gadolinium oxide, lanthanide oxide and yttria oxide (col. 4, ll. 1-3 as applied to claim 20).

The differences not yet discussed are of the electrolyte further comprising doped-zirconia (claim 18) and of using a cathode comprising (La,Sr)(Co,Fe) O<sub>3</sub> (claim 19).

With respect to claim 18:

Yajima teaches of solid electrolyte consisting essentially of cerium oxide can be used in place of a stabilized-zirconia electrolyte. However, if the fuel gas fed on its anode's side is H<sub>2</sub>, CH<sub>4</sub> or the like, the cerium oxide contained in the electrolyte may be partially reduced under the effect of the fuel gas at its operating temperature, which can present a problem of a decrease in terminal voltage. The above-mentioned problem can be solved by bonding a thin membrane of stabilized zirconia on the anode's side surface of the cerium oxide electrolyte. Chemical vapor deposition (CVD), electrochemical deposition (EVD), thermal spraying and the like have been proposed as a method for forming the thin membrane of stabilized zirconia (col. 1, ll. 19-31).

The bilayered structure represents an electrolyte wherein the cerium oxide has an interfacial region on the anode side surface of ceria and stabilized (doped) zirconia. This prevents partial reduction of the ceria portion of the electrolyte.

The motivation for incorporating doped zirconia to the doped-ceria electrolyte is that it prevents partial reduction of the ceria portion of the electrolyte from the fuel gas.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by further providing doped-zirconia with the doped-ceria of the electrolyte since it would have prevented partial reduction of the ceria portion of the electrolyte from the fuel gas..

With respect to claim 19:

The amendment to claim 19 has changed the materials specified as cathode materials. This lends claim 19 to a new grounds of rejection necessitated by

amendment. In light of the amendment, Weber is no longer applicable. However Wallin teaches of the newly claimed cathode materials as discussed below.

Wallin discloses of an electrode/electrolyte combination used in solid oxide fuel cells (abstract, col. 1, ll. 12-20, and col. 3, ll. 13-15 and 56-65) wherein the ion-conducting material in the electrode is a number of perovskite compositions. In particular when the ionically conductive material is ceria or doped ceria, Wallin teaches that the electrocatalyst in the electrode is preferably a cobalt iron based material, and further a  $\text{LaSrFeCoO}_3$  material (col. 6, ll. 7-9).

The motivation for using a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  is that it lowers the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by selecting the cathode to be a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  since it would have lowered the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

***Response to Arguments***

11. Applicant's provides no additional arguments to the rejection of claims 18-20 apart from those arguments discussed in item 7 above, incorporated herein.

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. patent No. 6,558,831 (Doshi) is drawn to integrated SOFCs. O.A. Marina et al. "A solid oxide fuel cell with a gadolina-doped ceria anode : preparation and performance " is drawn to doped ceria anodes in SOFCs. C. Xia et al. "Low-temperature SOFCs based on Gd-Ce-O fabricated by dry pressing" is drawn to anode-supported SOFCs. S.Souza et al. "Thin-film solid oxide fuel cell with high performance at low-temperature" discloses using colloidal spray techniques in forming layers in an SOFC. M. Sahibzada et al. "Operation of solid oxide fuel cells at reduced temperatures" discloses using ceria electrolytes to operate fuel cells at lower temperatures. O. Bellon et al. "Mechanical properties and electrochemical characteristics of extruded doped cerium oxide for use as an electrolyte for solid oxide fuel cells" discloses forming electrolytes by extrusion.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (571) 272-1283. The examiner can normally be reached on Monday to Thursday from 9 a.m. to 6 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. FAXES received after 4 p.m. will not be processed until the following business day. Information regarding the status of an application may be obtained from the Patent

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Gregg Cantelmo  
Primary Examiner  
Art Unit 1745

gc



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